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ABSTRACT

The effectiveness of the Elementary and Secondary Education Act Title I reading and mathematics laboratories were evaluated to assess the improvement of underachieving elementary school students' academic skills. Laboratory students were selected on the basis of academic (rather than socioeconomic) criteria in grades 2 through 5: the control groups were selected from non-Title I schools. Dependent variables were total reading and total mathematics scores on the Comprehensive Tests of Basic Skills (CTBS). Relative effectiveness of laboratory conditions was analyzed for each grade by analysis of covariance on the spring CTBS scores with the fall scores as covariate and group assignment as experimental treatment. It was determined that there was no statistically significant superiority of laboratory groups, except for fourth grade reading and mathematics in 1977-78 and third grade reading and fifth grade mathematics in 1976-77. CTBS scores were best predicted from the previous fall test administration. (Author/MH)

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An Analysis of the Effects of Individualized Reading and Math Labs on the Achievement of Academically Deprived Students in Berkeley County, West Virginia

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October 1979

Prepared for

Berkeley County, West Virginia Board of Education
Martinsburg, West Virginia

ABSTRACT

This study evaluates the effectiveness of Title I reading and math labs in improving the academic skills of underachieving elementary school children assigned to the labs on the basis of academic criteria rather than economic criteria, which had been previously applied.

During the 1975-1976 school year administrative procedures, test instruments, and lab methods were selected or developed. The program was first implemented and modifications made during the 1976-1977 school year. Full implementation was made during the 1977-1978 school year; during this period data was gathered to permit the comparison of lab (treatment) with non-lab (control) conditions.

Lab students were selected on the basis of academic criteria in grades two through five of eight Title I supported elementary schools in Berkeley County West Virginia; non-lab students were selected by means of the same criteria in grades two through five of five non-Title I schools in the same district. Dependent variables were total reading and total math scores on the Comprehensive Test of Basic Skills (CTBS), administered in the fall and spring of each academic year. The relative effectiveness of lab conditions was analyzed for each grade by means of the Analysis of Covariance on the spring CTBS scores with the fall scores as covariate and group assignment (lab or non-lab) as experimental treatment.

The Analysis of Covariance revealed that with the exception of 4th grade reading and math in the 1977-1978 school year and 3rd grade reading and 5th grade math in the 1976-1977 school year, there was no statistically significant superiority of lab over non-lab groups. For the most part spring CTBS scores in both reading and math were best predicted from the previous fall administration of the test.

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INTRODUCTION

Since 1975, Berkeley County, West Virginia, public schools have participted in an NIE-sponsored experiment, the purpose of which is to test the policy-relevant question posed by Congress: Can Title I funds be allocated in such a manner that the learning needs of both economically and educationally deprived school children are served without penalizing either group?

The formula for allocating Title I monies to states and local school systems has drawn criticism almost since its initial conception. Under the old formula established in 1965, an annual family income of $2,000 or under was viewed as at or below the poverty level. Under the new or modified formula introduced in the Educational Amendments of 1974, the poverty level is allowed to vary according to family size, its rural or nonrural status, and the sex of the head of the household. The 1970 Census is used as the basis for determining the distribution of poverty families throughout the United States.

The more recent formula also stipulates that only two-thirds of the AFDC children of families above the poverty level should be counted in determining a particular state's allocation. In addition, the formula uses only 40% of the average per pupil expenditure by state as a guide, rather than the 50% figure used in the original formula. In addition, poorer and wealthier states will receive no less than 80% or no more than 120% of the national average. The net result was that in FY 74, many counties gained or lost monies reflecting their changes in Census statistics between 1960 and 1970. Such shifts served to fan the fires of discontent with both the old and the new formulas.

Critics have argued for the distribution of Title I funds on the basis of actual or demonstrated educational need derived from a student's achievement on standards tests. Such an approach, it was argued, would eliminate the automatic labeling of all children from poor families as educationally deprived and the neglect of those children from higher income families who happen to have low achievement scores. Low-income families, they argued, explained only half the variance in student test scores. Thus, much remains to be explained by other than the economic status of one's family.

With reference to the specific problems of Berkeley County, discrepancies were found between the AFDC data printout and actual children in residence in the County. For example, if a child's last name differed from that of his parents, locating the youngster was virtually impossible. Outdated lists, in and out migrants, inadequate information for youngster identification represent a few of the other shortcomings of the data printout. This created problems, for example, in making it possible to provide special services to those children who would qualify if the data tape was more current.

To determine if a more effective and equitable formula for distributing Title I funds could be developed, the Educational Amendments of 1974 included a provision for a mandated study by NIE to examine the current effectiveness of compensatory education programs, to analyze ways of identifying all children in need of compensatory education, to consider alternative strategies for meeting those needs, and to examine the feasibility, costs and consequences of alternative ways of distributing compensatory education funds.

In Berkeley County, the compensatory education program in operation prior to 1976 provided special assistance by professional and non-professional personnel at the elementary level. Individual assistance was provided to students whose mathematics deficiency is below "grade level." Materials used

throughout the program were multi-leveled, ungraded, and individualized to meet specific deficiencies of participating students.

These materials included the Imperial Primary Mathematics Program, the Tarmac Skill-Drill Mathematics Program and the Acoustifone (All About Ten) Mathematics Program.

Each professional and/or non-professional instructed one individual student or no more than eight (8) students for a period of not less than thiry (30) minutes daily.

Through the utilization of mathematics laboratory materials, hardware and software by the competent personnel named above, the necessary mathematics skills are taught.

A speech therapist was provided for those identified Title I students in need of this service. Also, a home-school coordinator was available to assist students participating in this program.

The testing program in operation in the County includes the Educational Development Series administered to third and sixth graders. For purposes of identifying Title I youngsters, the Metropolitan Achivement Instrument is used. In addition, criterion reference tests were built into the instructional materials being used in the remedial programs. Berkeley County, however, had not been satisfied with the tests in use at that time and anticipated that this particular area would be strengthened by activities supported by the NIE grant.

In terms of the Demonstration Project, the overall strategy for Berkeley County has been to devise an allocation formula that will, in effect, make it possible to concentrate Title I resources on those schools and those students whose learning problems are, as evidenced by appropriate achievement measures, in need of special assistance. However, rather than changing the way in which funds were allocated to the target schools, the County proposed

to change the criteria by which students are selected for inclusion in the remedial programs supported by Title I funds. Thus, the selection criteria would be based on appropriate normative achievement test scores and criterion reference measures employed in specific instructional programs. As such, no waivers would be required in state regulations pertaining to the use of Title I funds.

The experimental program is comprised of three phases, occurring over a three-year period commencing with the 1975 inception. The year 1975-1976 was principally devoted to planning activities, where the major components of the project were outlined by the Berkeley County School Board in cooperation with the Human Resources Research Organization (HumRRO) and under the general oversight of NIE. Procedures were adopted for assigning elementary schools to experimental and control groups, systematically assigning under-achieving youngsters to compensatory education services in reading and in math.

During the planning year of the proposed study, Berkeley County submitted to NIE two interim reports and one final report. In each of the interim reports (October, 1975, and February, 1976), Berkeley County's consulting organization (HumRRO) developed and submitted for the approval of the Berkeley County staff two detailed evaluation strategies. In October, for example, we recommended that the schools to be involved in the study be assigned to an experimental (Group I) or control (Group II) status. It was noted while all 13 of the Berkeley County elementary schools could be described as multi-level, ungraded and individualized, there were essential differences between the various schools in terms of classroom layout (open versus traditional), the availability of reading and math laboratory equipment, and capabilities of the teaching staff. An attempt was made in the initial design to match the more significant factors in the assignment of schools to treatment or non-treatment status. The socioeconomic status of the local area served,

the number of students served, the urban-rural status of the schools, the existence of reading and math labs, and open versus traditional classroom facilities were considered. By matching on these variables and systematically varying the use of criterion referenced tests as a diagnostic and prescriptive procedure, it was hoped that the benefits associated with providing compensatory education for the educationally as well as the economically deprived could be ascertained.

In 1976, prior to the beginning of the school year, initial plans for conduct and evaluation of the project were reviewed and modified to accommodate administrative exigencies and the requisites of valid evaluation methodology.

Following the analysis of the results of an initial administration of the Comprehensive Test of Basic Skills (CTBS) to all Berkeley County elementary school children, the original plan was radically altered to insure a better match of student abilities in the schools assigned to treatment and non-treatment groupings. Through the analysis of the CTBS test data, it was discovered that when the standard grade equivalent units (SGEs) were converted to standard units of measurement (Z scores), the reading and math scores of students in the proposed treatment grouping of schools were significantly below that of the schools in the control group. Using the Z scores, a percentile rank for each SGE for each grade at each school was assigned covering both reading and math. A comparison of grades within and between schools was possible because no matter what the means and standard deviations of the raw scores happened to be, the standardized variable Z would have the same mean and standard deviation. Thus, it was determined that the difference between the experimental and control groups was significant at the .01 level. A regrouping was then suggested with attention to be given to the same background factors considered in the original grouping. No significant differences between proposed groupings were found in this new assignment.

A proposal offered by HumRRO became the basis for selecting and assigning students from the eight experimental schools to reading and math labs, adopting the programs and services to be offered to the students selected, and outlining how the results of the program are to be evaluated. Personnel assignments, training programs, type of equipment and materials to be purchased, etc., were also specified.

On the basis of these specifications, the compensatory reading and math programs were implemented during the school year, beginning in September, 1976.

The last year of the project (1977-1978) served as the evaluation year for the project. Since the prior year offered the opportunity to "fine tune" the lab program in terms of smoothing out operational problems and thoroughly familiarizing staff with the tools and methods of the program, 1977-1978 should have seen the maximally effective and efficient conduct of the reading and math labs. As in the previous year, detailed data was collected on student performance and time spent in the labs. These data, together with information describing other appropriate characteristics of schools and students were used in a detailed analysis and evaluation of the compensatory education project conducted in the final year of its operation.

In summary, the three-fold purpose of the demonstration project during the next two academic years (September 1976-August 1978) was to (1) answer the policy-relevant research question on the alternative uses of Title I funds, (2) evaluate the benefits derived from new approaches to the selection, diagnosis, prescription of compensatory reading and math programs for students at the elementary school level, and (3) determine if these new procedures actually improve the efficiency with which Title I resources are used to broaden and intensify the learning experiences of under-achieving students.

In order to answer these three questions, Berkeley County undertook to increase the number of children participating in the Title I (and ESAA) sponsored reading and math laboratory programs and, at the same time, provide more hours of instruction for each child involved. In addition, the County staff modified their procedure for screening and assigning students to the math and reading labs. In the labs, math and reading specialists together with their aides employed criterion-referenced tests to diagnose and prescribe modularized instructional materials for students working individually or in small groups of three or four children.

METHOD

Treatment and Resource Allocation

The experimental or treatment groups included those eight schools with either Title I or ESAA instructional labs. Students attending these schools who qualified for lab instruction received individual attention from a special education teacher, assisted by one or two aides. Criterion-referenced tests were administered initially as diagnostic tools. Reading and math assignments were then geared to specific skills or behaviors. While some students were assigned to individual study carrels, others worked in small groups (3 to 4) under the tutelage of the special education teacher. Learning assignments were to be guided by the use of CRT's throughout the compensatory education effort. The section on "Selection of Achievement and Criterion-Referenced Tests" will describe in greater detail the instructional materials made available to students and teachers.

Figure 1 stipulates how the Berkeley County schools were assigned to a treatment or comparison group. Note that thirteen Berkeley County elementary schools have been broken into two groups: the "experimental" schools fall into two categories, those that have been operating as Title I schools with access to reading and math lab, and those that have either ESAA labs or a combination of ESAA and Title I labs. The second group served as a control group; these are the schools which did not qualify as Title I or ESAA schools.

Experimental Grouping	Academic Year '75-'76	'76-'77	'77-'78
Title I Schools (Group A)	CP	PP	PP
Burke Street			
Gerrardstown			
Hedgesville			
Northwest*			
Winchester Avenue			
ESAA (and Title I Schools) (Group B)	CP	PP	PP
Berkeley Heights (ESAA)			
Opequon (ESAA)			
Rosemont (ESAA and Title I)			
Control Grouping			
Non-Lab Schools (Group C)	WL	WL	WL
Back Creek Valley			
Bedington			
Bunker Hill**			
Marlowe			
Valley View			

Legend:

WL = Without Lab
CP = Conventional Program
PP = Proposed Program

* Since Northwest was not operating in '75-'76, it had no program at that time.

** Bunker Hill and Marlowe had mobile lab instructional units during academic year '75-'76. These mobile units had been reallocated in 1976-77 for the testing of migrant students.

Figure 1. DISTRIBUTION OF BERKELEY COUNTY SCHOOLS INTO EXPERIMENTAL AND CONTROL GROUPINGS

Selection of Achievement and Criterion-Referenced Tests

During the early part of the Planning Year (Fall 1975), the project coordinator and HumRRO consultants conducted an in-depth review of available achievement tests for administration to all Berkeley County elementary school students at the beginning and at the end of the school year. The first Interim Report (October 1975) describes the search conducted with the result that the McGraw-Hill Comprehensive Test of Basic Skills (CTBS) was selected. This instrument replaced the Scholastic Testing Service (STS) required by the state testing program for use in the third and sixth grades. Coincidentally, the State Department of Education independently decided to adopt the CTBS instrument for statewide administration in subsequent years.

In the screening and selection of the criterion-referenced test for use in diagnosing and prescribing learning materials in reading and math, a somewhat different procedure was used. The HumRRO consultants contacted the ERIC Clearinghouse on Testing in Princeton, New Jersey, and arranged to review the various criterion-referenced tests on file at that location. Available copies were also sent to the Berkeley County coordinator for her review. From among six or seven commercially available instruments, two were chosen for more careful study. The Prescriptive Reading Inventory (PRI) and the Diagnostic Mathematics Inventory (DMI) published by McGraw-Hill were contrasted with the Individualized Criterion-Referenced Test (ICRT) published by the Educational Development Corporation. The following Analysis presents in a somewhat abbreviated fashion the criteria used in deciding on the ICRT material.

1. Comparison of testing objectives. ICRT contains more than 300 measured behaviors in reading in contrast with only 155 for the PRI. Thus, it was felt that the PRI behaviors would not be as helpful in pinpointing a child's particular needs.

The ICRT tests the child's ability to identify all beginning and ending consonant sounds, the initial consonant sounds separately at Level 1. In contrast, the PRI testbook (the Red Book) tests students at the 1.5 grade level and uses only 5 items to determine what the child knows or does not know in consonant and vowel sounds. Because children do not learn all consonant and vowel sounds at once, it was felt that the reading lab teacher would want to identify which consonant and vowel sounds a student knows and which he needs to learn. ICRT offers this advantage while PRI does not.

PRI test constructors chose to distinguish between "process" and "terminal" objectives, in favor of terminal ones. While this distinction is valuable in that it permits the McGraw-Hill testers to estimate standard achievement test scores from the criterion referenced tests, it is also the source of much of PRI's weakness. Terminal objectives do not describe what a student needs to learn; its major purpose is to describe in general terms what a student already knows. In contrast, the ICRT Reading and Math tests provide information on knowledge and skills a student has learned and the specific knowledge and skills he or she should learn next.

The recently revised McGraw-Hill DMI (formerly known as the Prescriptive Mathematics Inventory) is an improved series of criterion-referenced tests which cover 325 objectives in traditional and contemporary mathematics. DMI is divided into 7 levels which span grades 1.5-7.5 and beyond for remedial students. Since both the DMI and the ICRT cover approximately the same number of objectives, it is felt that ordering both the reading and math tests from one publisher would simplify the job.

Both the Educational Development Corporation and McGraw-Hill criterion-referenced tests identify specific instructional resources that teachers may use in teaching the basic skills tested. These study guides refer teachers

(and students) to those pages in standard textbooks which can be used to teach specific objectives. Typically, the study guide lists the textbooks and pages upon which objectives measured by the CRT's are taught. Both publishers also give suggestions for classroom activities that could be keyed to the objectives. All items used to determine a student's mastery of specific reading and math objectives were subjected to nationwide tryouts to determine the validity and sensitivity of the objectives to instruction.

2. Test appearance and administration. ICRT offers many booklets for both reading and math. These series of booklets (Levels 1 through 8) are color coded with each booklet containing tests for 8 objectives (with two items per objective). Since there are 329 objectives in the reading area and 312 objectives in math, there are approximately 40 booklets in reading and 38 booklets in math. Student answer sheets are provided for each booklet and are machine scorable. Test booklets come in two forms (Forms A and B) making it possible to test and retest students at any level.

The PRI and DMI tests of McGraw-Hill offer only 7 to 9 color-coded test booklets. The orange book of the PRI series, for example, attempts to assess where a student stands in three grade levels of instruction (grades 4 through 6) with fewer than 40 objectives.

Both publishers provide machine scorable answer sheets and hand scorable templates are also available. Both package their test booklets in alternate forms in a series of kits. Each kit contains booklets for designated levels. In addition, EDC offers booklets which measure two levels below the level being tested, except at levels 1 and 2. Teachers' manuals, instructional guides, and, in the case of EDC, orientation cassettes are also provided.

3. Computer printouts. The PRI offers four types of printouts, two of which are classified as optional and represent an added expense. The

Individual Diagnostic Map (IDM) provided by PRI identifies objectives mastered, not mastered and needing review. The Class Diagnostic Map uses the same categories as the IDM to show the level of mastery of each objective for the class as a whole expressed in percentages. (It is difficult to understand why McGraw-Hill felt that this type of printout would be useful to teachers unless the instructor was teaching the whole class at one time. What would one do with the information that 46% of the class had mastered variant vowel sounds?) The other two optional printouts are even less useful than the two just described, and, according to Fairfax County (Virginia) informants, are even more confusing.

The ICRT printouts, on the other hand, are offered in four formats designed for student, teacher, and administrator use. The Student Summary includes a diagnosis, objective by objective, for the student (and parent) and teacher. This report lists those skills the student has learned, needs to review and needs to learn next. A description listing five cross-referenced resource texts is also provided for each objective. Separate descriptions are given both for instruction and for enrichment and extension of skills mastered.

The Instructional Grouping Report lists for the teacher those students who need instruction for each objective tested, the number who attempted it and the number who passed each objective, descriptions of each objective, and approximate working level of each student in the group.

The Building Summary lists by class and by building the number of students who attempted each objective and the number who passed.

The District Summary lists, by age, the number of students who attempted each objective and the number who passed.

4. Cost comparison. The pricing structure of the McGraw-Hill materials are more complex than ICRT but, after careful analysis, turned out to be nearly twice as expensive. Without going into details, the initial cost of testing 500 first- and second-grade students with PRI, including the two optional printouts, is about $1,012, whereas the initial cost of testing 500 first- and second-grade students with ICRT is about $650.

Testing Schedule

Students in both the treatment and control groups were administered the student achievement test (CTBS) in the Fall of 1976 and 1977, and again in the Spring of 1977 and 1978 (see Table 1). To insure comparability between the pre- and post-tests, the same level of the same test was administered on both occasions to all students in the same grade (although different test forms were used). Test administrators were given detailed directions to follow (see example, Figure 2).

Analyses of the program impact should be based only on the participants with both pre- and post-test scores. Although it is not possible to prevent students from dropping out or entering a project after it has begun, it is essential to base any conclusions on the project impact using data from students who have both pre- and post-test scores. It is also essential when comparison groups are being used that the testing of treatment and non-treatment students be no more than a few days apart to insure the reliability of test result comparisons.

TABLE I

SCHEDULE OF TEST ADMINISTRATION

	Fall '75	Spring '76	Fall '76	Spring '77	Fall '77	Spring '78
Student Achievement Test (CTBS)	1)[a] October 1975 2)[b] Grades 1 - 6 3)[c] All Students 4)[d] Complete Battery of Tests	1) April 1976 2) Grades 1 - 6 3) All Students 4) Complete Battery of Tests	1) October 1976 2) Grades 2 - 5 3) All Students 4) Reading and Math Tests Only	1) April 1977 2) Grades 2 - 5 3) All Students 4) Reading and Math Tests Only	1) October 1977 2) Grades 2 - 5 3) All Students 4) Reading and Math Tests Only	1) April 1978 2) Grades 2 - 5 3) All Students 4) Reading and Math Tests Only
IQ Test (Short Form Test of Academic Aptitude)	NOT ADMINISTERED	1) April 1976 2) Grades 1 - 6 3) All Students	NOT ADMINISTERED	1) April 1976 2) Grades 1 - 5 3) All Students	NOT ADMINISTERED	1) April 1976 2) Grades 1 - 5 3) All Students
Criterion Referenced Test	NOT ADMINISTERED	NOT ADMINISTERED	ADMINISTERED to lab students only for diagnostic and prescriptive purposes on a continuous basis throughout the school year.		ADMINISTERED to lab students only for diagnostic and prescriptive purposes on a continuous basis throughout the school year.	

[a] 1) Month in which tests are to be administered.
[b] 2) Grade levels to be tested.
[c] 3) Groups to whom tests are to be administered.
[d] 4) Tests to be administered

EXAMPLE

BERKELEY COUNTY BOARD OF EDUCATION
SPECIAL DIRECTIONS FOR TESTING

Comprehensive Test Of Basic Skills
March, 1976

1. Administer the Reading Vocabulary, the Reading Comprehension, the Mathematics Computation, the Mathematics Concepts and Applications, and the Short Form Test of Academic Aptitude.

2. Space the testing periods to avoid fatigue.

3. Avoid making students miss recess, art, music or library classes.

4. Eliminate distractions.

5. Do not exceed 30 students in a group being tested. Grade 1 (15).

6. Have students use No. 2 pencils (medium dull).

7. Complete the green group information sheet on the front only. The number of students tested should be the same as the number of students' answer sheets or booklets compiled. Instructions are on the back. Omit the special code section.

8. Complete the information on the front of the brown envelope. The level and form of your test can be found on the front of each test booklet.

9. Check all answer sheets for errors and enclose in the brown group information envelope.

10. Do not cut or mail group information envelopes. Return to the NIE Coordinator, Berkeley County Board of Education.

11. Keep all materials in a safe place for the test coordinator.

12. Please submit a typed list of your faculty including the grade level of their instruction to the test coordinator. It is needed at the scoring center.

13. Administer the SFTAA*in one session. Actual testing time is approximately thirty-four minutes for Level 2, but one hour should be allowed for directions and preparation time without any breaks.

14. Do not administer the SFTAA on the same day as the CTBS.

15. Paper bind the first and second grade booklets with the green group information sheet on top.

*Short Form Test of Academic Aptitude.

Figure 2.

Monitoring Student Progress

To insure maximum utilization of the labs without hindering instructional effectiveness, ten students were assigned to each session (each 1/2 hour period). Each math and reading lab has at least one specialist and additional teacher aides.*

The labs are equipped with five carrels (individualized study tables), and those students who are not working in a carrel will be working in small groups with teacher and/or aide assistance. This gave the lab teachers an opportunity to assess how well the students in the group mode were doing as contrasted with the individual modes.

Each teacher was given record sheets to monitor each student's progress. Approximately one hour had been set aside each day for lab teachers and aides to log student data, administer and score CRT's, and perform other assignments required in the management of an individualized lab program. The record sheets for the reading and math labs (see Figures 3 and 4) provided space for pre- and post-test scores, dates concerning assignment to the lab and hours spent in the lab. An additional record sheet was given to each homeroom teacher in each grade at each school in both the experimental and control groups. These record sheets provided a more convenient form for recording test scores from computer printouts.

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*Because Rosemont qualifies for both a Title I and an ESAA lab, two specialists were assigned to this school, making it possible to serve twice as many students.

Lab Teacher: _____ School: _____

Aide: _____ Phone: _____

Title I Students	Sex M/F	Grade	Pretest SS*	Posttest SS	Pretest PR**	Posttest PR	+Gain -Loss	Date Assigned To Lab	Date Leaving Lab	Hours Per Week in Lab	Total # of hours in Lab
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											
11.											
12.											
13.											
14.											
15.											

* Standard Score ** Percentile Rank

Figure 3. READING RECORD 1976-77 (TITLE I)

Lab Teacher: _____ School: _____

Aide: _____ Phone: _____

Title I Students	Sex M/F	Grade	Pretest SS*	Posttest SS	Pretest PR**	Posttest PR	+Gain -Loss	Date Assigned To Lab	Date Leaving Lab	Hours Per Week in Lab	Total # of hours in Lab
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											
11.											
12.											
13.											
14.											
15.											

* Standard Score ** Percentile Rank

Figure 4. MATH RECORD 1976-77 (TITLE I)

Teacher Training Workshop

In order to prepare the lab teachers and aides for the use of CRT's, a five-day workshop was organized and conducted by HumRRO during August of 1976. Experimental school principals and homeroom teachers were invited to attend a one-day orientation program scheduled at the beginning of the program. Teacher logs and student monitoring forms were introduced and explained as part of the training. In addition, laboratory management procedures were explored with specific attention given over to the use of reinforcement techniques, supervised group study, use of questions, tutoring techniques, student attention to tasks, etc.

Analytical Procedure

Figure 5 identifies the comparisons to be made between the various experimental and control groups. It should be noted that since Northwest School was not in operation during the academic year 1975-76, it was not used in any statistical comparisons Δ '76 (Δ signifies the differential effects of the new diagnostic and treatment program). In addition, students were eliminated from the sample if they did not have both pre-test and post-test scores on all tests that were administered to his or her grade. Children were included only if they attended the instructional group for 75% or more of the assigned time.

The standardized achievement tests were administered twice a year through the Spring of 1978. Tests administered in the Fall of 1976 served, for example, as the pre-test to those given in the Spring of 1977. (See section on "Testing Schedule" for a more detailed description of how those tests have been scheduled.)

Primary Statistical Comparisons

Compare current program with proposed program within groups	Δ '76 A vs Δ '77, Δ '78 A
	Δ '76 B vs Δ '77, Δ '78 B
	Δ '76 A&B vs Δ '77, Δ '78 A&B
Compare non-lab program with proposed program	Δ '77 A&B vs Δ '77 C
	Δ '78 A&B vs Δ '78 C

Figure 5. PRIMARY AND SUPPLEMENTARY STATISTICAL COMPARISONS*

*Northwest School was not included in statistical comparison involving Δ '76 since the school was not operating during 1975-76.

The model suggested for evaluating the impact of the lab program is analysis of covariance. Students were assigned randomly to treatment and comparison groups (since the pre-existing groups, that is the schools, can be considered random samples from a single population). Analysis of covariance provides an appropriate statistical adjustment to compensate for pre-test score differences between groups if these differences are due to random sampling fluctuations. Because analysis of covariance provides adjusted observed post-test scores for the random pre-test differences, the comparison of the post-test means is always more precise than comparing unadjusted post-test scores.

After the post-tests were administered, raw scores were converted to their standard grade equivalents. If there is no difference between the groups on the pre-test, analysis of covariance is not needed. Assuming the groups differed in mean pre-test scores, an analysis of covariance is recommended.

As mentioned earlier, when treatment and control groups are used to compare students, it is not advisable to combine data of different grade levels. Therefore, all statistical computations were analyzed using each grade level as a separate subgroup, drawing separate conclusions for each group. Test of significance will serve as confirmation that differences were or were not likely to be due to chance factors. This also takes into account the size of the sample. The question of how big a gain must be before it can be considered educationally important is a judgmental question rather than a statistical one. Finally, it should be noted that all evaluations are directed at the question of how much better students do in a project than they would have done without it. This analysis utilized controls on those student characteristics which are likely to influence achievement.

Thus, we control for previous achievement, sex, socioeconomic level (SES). Such information was recorded by means of data sheets maintained on each individual student by lab and homeroom teachers.

RESULTS

This section reports the findings of our analyses concerning the influence of the Title I demonstration labs on performance of students in the areas of reading and mathematics. As described earlier, schools in Berkeley County were divided into two groups: those funded by Title I or ESAA funds and those not so funded or supported.

In the Title I and ESAA schools students in grades 2 through 5 whose reading and math Fall CTBS pre-scores were equal to or less than the 40th percentile in reading and the 27th percentile in mathematics were the recipients of individualized reading and math instruction; there were 8 such schools in the experimental group. The remaining 5 schools, which were not recipients of either Title I or ESAA funds, comprised the control group; a sample of students from each school and each grade (2-5) within each of these 5 schools were selected on the basis of the lab eligibility criteria for membership in the control group.

Tables 2 and 3 present the number of students served by the reading and math labs respectively in the school years 1976-1977 and 1977-1978, respectively. It may be seen from Table 2 that 686 students were served in the reading labs during the 1976-1977 school year and 677 were served during the 1977-1978 school year. The samples selected from the five control schools for these two years for comparison with the reading lab students were 331 and 293, respectively; these students were selected on the basis of their CTBS pre-test eligiblity scores. Table 3 shows that during the 1976-1977 school year 367 children in grades 2 through 5 were served in the math labs and 427 were served during the 1977-1978 school year; in 1976-1977, 326 students from the control schools were sampled and in 1977-1978, 300 were sampled.

Grades	School Year 1976-1977	1977-1978
Grade 2	128	129
Grade 3	156	174
Grade 4	179	175
Grade 5	223	199
TOTAL	686	677

TABLE 2: Number of Students Assigned to Reading Labs

Grades	School Year 1976-1977	1977-1978
Grade 2	53	94
Grade 3	75	105
Grade 4	123	118
Grade 5	116	110
TOTAL	367	427

TABLE 3: Number of Students Assigned to Math Labs

The remainder of the present section describes the findings concerning the comparison of the experimental and control schools on the Spring-administered CTBS post-scores for reading and then for math; for each of these subjects the findings will be presented for the 1976-1977 and 1977-1978 school years, respectively.

Reading

Tables 4, 5 and 6 present the findings of the Analysis of Covariance of the reading labs for the 1976-1977 school year for grades 3, 4, and 5. Referring to Table 4, we see that there are in the left margin several sources of variation or influence analyzed for the CTBS post-test scores. The first, Saturated Model, refers to the effect of group membership (lab or control group) and CTBS reading pre-test score. In this type of analysis the inclusion of the pre-test score as a covariate is to ensure that any differences obtained between groups on post-test scores is due to a result of the presence or absence of the lab treatment and not pre-existing differences between the groups in the pre-test scores. Without such statistical control of the pre-test score, differences in post-test score between the groups could be spuriously inflated; specifically, if one or the other groups' pre-test scores were significantly lower, then the amount of gain or percentage gain on the post-test score could be artifically increased for that group. The statistical control for differences in pre-test score between groups is represented in element 3 of the Table: Interaction of the Groups with Pre-Test (covariate effect).

The three elements in the analysis of covariance table of principal concern for this study are elements 2a, 2b, and 3. As just mentioned, element 3 controls for the interaction of group and pre-test. A significant

SOURCE OF VARIATION	Sum of Squares	Degree of Freedom	F-Ratio
1) Saturated Model	.29732	3	33.850*
2) Additive Model	.29408	2	50.222*
a) Pre-test adjusted for Group	.28531	1	97.449*
b) Group adjusted for Pre-test	.02538	1	8.670**
3) Interaction of group with pre-test (covariate effect)	.00324	1	1.107
4) Residual	.70268	240	

*$p << .01$

**$p < .01$

TABLE 4: Covariance Analysis of CTBS Reading Post-Test Scores of 3rd Grade Lab and Non-Lab Students for the 1976-1977 School Year; Covariate is CTBS Reading Pre-Test Score.

SOURCE OF VARIATION	Sum of Squares	Degree of Freedom	F-Ratio
1) Saturated Model	.44888	3	76.733*
2) Additive Model	.42813	2	109.779*
a) Pre-test adjusted for Group	.42231	1	216.569*
b) Group adjusted for Pre-test	.00228	1	1.169
3) Interaction of group with pre-test (covariate effect)	.02075	1	10.641**
4) Residual	.55112	282	

*$p << .01$

**$p < .01$

TABLE 5: Covariance Analysis of CTBS Reading Post-Test Scores of 4th Grade Lab and Non-Lab Students for the 1976-1977 School Year; Covariate is CTBS Reading Pre-Test Score.

	SOURCE OF VARIATION	Sum of Squares	Degree of Freedom	F-Ratio
1)	Saturated Model	.53779	3	121.395*
2)	Additive Model	.53766	2	182.048*
	a) Pre-test adjusted for Group	.52381	1	354.717*
	b) Group adjusted for Pre-test	.00001	1	.00677
3)	Interaction of group with pre-test (covariate effect)	.00013	1	.08803
4)	Residual	.46221	313	

*$p << .01$

TABLE 6: Covariance Analysis of CTBS Reading Post-Test Scores of 5th Grade Lab and Non-Lab Students for the 1976-1977 School Year; Covariate is CTBS Reading Pre-Test Score.

	Grade 2				Grade 3				Grade 4				Grade 5			
	Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test	
	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N
Title I/ESAA Demonstration Lab Students	-		1.6	138	3.1	153	2.4	164	3.8	198	3.3	188	4.9	216	4.1	237
Non-Lab Students	-		1.7	86	3.3	101	2.2	117	3.6	117	2.9	130	4.5	113	3.7	116

Table 7: Mean CTBS Reading Pre-test and Post-test Scores for Lab and Non lab Students in Grades 2 through 5; 1976 - 1977 School Year

interaction would indicate that pre-test score is a function of group membership; specifically a significant outcome for element 3 would mean that, for example, either control group students' pre-test scores were uniformly or largely greater than lab students' pre-test scores; or that lab students pre-test scores were generally higher than control students. The Table indicates that for 3rd grade students this is not the case. Referring to Table 7 we see that under 3rd grade, the pre-test scores of the lab students, in terms of standard grade equivalent, is two years and 4 months, while non-lab students is 2 years and 2 months--not statistically significant.

Elements 2a and 2b of Table 4 indicate the effect of pre-test score (2a) on post-test score and for group membership (2b) on post-test score. For the 3rd grade students in the 1976-1977 school year the single most significant influence on post-test score is pre-test score. That is, the greater the pre-test score the greater the post-test score. The table also indicates, however, that the treatment condition also had an influence on CTBS post-test score, albeit a much less significant influence. However, referring again to Table 7 we see that for the 3rd graders the higher post-test scores were achieved by the non-lab students and that while they started out with lower pre-test scores than the lab students, their Spring 1977 CTBS reading scores were greater.

Table 5 presents the analysis of covariance finding for CTBS reading scores for 4th graders in the school year 1976-1977. In this case we see from the table that the relationship between pre-test and post-test score was significantly different for the control and lab groups. Referring to the grade 4 mean pre- and post-test scores for experimental and control students (Table 7), it can be seen that the differences between pre-test scores in reading for the 4th graders is 4 months while the difference

between post-test scores is only 2 months. Compare this with the 3rd grade, where the difference between pre- and post-test scores between lab and control groups is 2 months, respectively in each case. This finding suggests that despite the fact that pre-test score as shown in element 2a of Table 5 appears to be the primary determiner of post-test score, in the case of the 4th graders in the 1976-1977 school year the non-lab students, despite their lower pre-test scores, made proportionately greater gains than the experimental students.

In Table 6 we see that for the fifth graders the analysis of covariance indicates that the single significant determiner of post-test score is pre-test score. That is, regardless of whether the student was assigned to the lab or whether he was in a control condition the greater his pre-test score, the greater will be his post-test score. Referring again to the data in Table 7, we can see that while the lab students had a pre-test score of 4 years, one month and the control students had a pre-test of 3 years, 7 months, both groups gained 8 months in skill from the pre-test to the post-test.

In summary with respect to the 1976-1977 reading labs, it appears that the only grade in which group membership made a difference was the 3rd grade; and in this case, it appeared that membership in a control group indicated or predicted better improvement from pre-test to post-test.

Tables 8, 9, 10 and 11 present the corresponding findings for the school year 1977-1978. Examination of these tables shows that with the exception of the 4th grade the principal determiner of CTBS reading post-test score is pre-test score. In Table 10 it shows that there is a significant group effect for the 4th graders. Referring to Table 12, we see that the amount of gain for the lab students in grade 4 is 7 months from pre-test to post-test, while for the control students the gain is 5 months.

	SOURCE OF VARIATION	Sum of Squares	Degree of Freedom	F-Ratio
1)	Saturated Model	.40038	3	45.183*
2)	Additive Model	.39715	2	67.227*
	a) Pre-test adjusted for Group	.39514	1	133.773*
	b) Group adjusted for Pre-test	.00442	1	1.496
3)	Interaction of group with pre-test (covariate effect)	.00323	1	1.094
4)	Residual	.59962	203	

*$p << .01$

TABLE 8: Covariance Analysis of CTBS Reading Post-Test Scores of 2nd Grade Lab and Non-Lab Students for the 1977-1978 School Year; Covariate is CTBS Reading Pre-Test Score.

SOURCE OF VARIATION	Sum of Squares	Degree of Freedom	F-Ratio
1) Saturated Model	.15343	3	13.895**
2) Additive Model	.13982	2	38.994*
a) Pre-test adjusted for Group	.13890	1	37.737*
b) Group adjusted for Pre-test	.00226	1	.614
3) Interaction of group with pre-test (covariate effect)	.01361	1	3.698
4) Residual	.84657	230	

*$p << .01$

**$p < .01$

TABLE 9: Covariance Analysis of CTBS Reading Post-Test Scores of 3rd Grade Lab and Non-Lab Students for the 1977-1978 School Year; Covariate is CTBS Reading Pre-Test Score.

	SOURCE OF VARIATION	Sum of Squares	Degree of Freedom	F-Ratio
1)	Saturated Model	.48763	3	71.697*
2)	Additive Model	.48548	2	107.071*
	a) Pre-test adjusted for Group	.42898	1	189.220*
	b) Group adjusted for Pre-test	.01567	1	6.912**
3)	Interaction of group with pre-test (covariate effect)	.00215	1	.948
4)	Residual	.51237	226	

*$p << .01$

**$p < .01$

TABLE 10: Covariance Analysis of CTBS Reading Post-Test Scores of 4th Grade Lab and Non-Lab Students for the 1977-1978 School Year; Covariate is CTBS Reading Pre-Test Score.

	SOURCE OF VARIATION	Sum of Squares	Degree of Freedom	F-Ratio
1)	Saturated Model	.62018	3	152,938*
2)	Additive Model	.61816	2	228.660*
	a) Pre-test adjusted for Group	.56260	1	416.217*
	b) Group adjusted for Pre-test	.001410	1	1.043
3)	Interaction of group with pre-test (covariate effect)	.00202	1	1.494
4)	Residual	.37982	281	

*$p << .01$

TABLE 11: Covariance Analysis of CTBS Reading Post-Test Scores of 5th Grade Lab and Non-Lab Students for the 1977-1978 School Year; Covariate is CTBS Reading Pre-Test Score.

	Grade 2				Grade 3				Grade 4				Grade 5			
	Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test	
	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N
Title I/ESAA Demonstration Lab Students	2.3	152	1.7	159	3.1	175	2.4	182	3.10	180	3.3	181	4.10	208	4.2	215
Non-Lab Students	2.3	77	1.6	88	3.2	73	2.4	92	3.3	58	2.9	74	4.3	85	3.6	103

Table 12: Mean CTBS Reading Pre-test and Post-test Scores for Lab and Non-lab Students in Grades 2 through 5; 1977 - 1978 School Year

In this case it would appear that there was some beneficial influence of membership in the experimental group. In all other cases, as has been said, the main contributer to gain in post-test score is pre-test score. In Table 12, it shows that the gain in pre-test to post-test for all grades except grade 4 do not differ between lab and control students by more than 1 month. In the case of the 4th graders, the difference is 4 months gain.

Math

The results of the analysis of covariance for the effects of the math labs on CTBS post-scores for school year 1976-1977 are presented in Tables 13, 14, and 15. In Table 13 it can be seen that for the 3rd grade students the significant factor influencing or contributing to post-test score is pre-test score. The effect of membership in lab or control group did not have an effect. In Table 16 it can be seen that while the gain in the case of lab students was from 2 years, 4 months on the pre-test to 3 years, 3 months on the post-test, the gain of 9 months was not significantly different from the 11 month gain on the corresponding tests among the non-lab students. Table 14 shows that similar findings resulted for 4th grade students; that is again, the principal contributer to post-test score was pre-test score the effect of group membership was not significant. However, among the 5th graders, there was a group effect; Table 15 shows that the influence of group membership was significant beyond the 1% level. Referring to Table 16, we see that there was a 12 month gain from pre-test to post-test among the lab students and a 10 month gain among non-lab students. This finding, according to the analysis covariance table, is significant statistically.

The results for lab and control math students in school year 1977-1978 are presented in Tables 17, 18, 19 and 20. Examination of Tables 17 and 18

	SOURCE OF VARIATION	Sum of Squares	Degree of Freedom	F-Ratio
1)	Saturated Model	.25395	3	27.232*
2)	Additive Model	.25349	2	40.774*
	a) Pre-test adjusted for Group	.25318	1	81.448*
	b) Group adjusted for Pre-test	.00906	1	2.915
3)	Interaction of group with pre-test (covariate effect)	.00046	1	.147
4)	Residual	.74605	240	

*$p << .01$

TABLE 13: Covariance Analysis of CTBS Math Post-Test Scores of 3rd Grade Lab and Non-Lab Students for the 1976-1977 School Year; Covariate is CTBS Math Pre-Test Score.

	SOURCE OF VARIATION	Sum of Squares	Degree of Freedom	F-Ratio
1)	Saturated Model	.39852	3	62.281*
2)	Additive Model	.39626	2	92.892*
	a) Pre-test adjusted for Group	.36587	1	171.536*
	b) Group adjusted for Pre-test	.00562	1	2.635
3)	Interaction of group with pre-test (covariate effect)	.00226	1	1.060
4)	Residual	.60148	282	

*$p << .01$

TABLE 14: Covariance Analysis of CTBS Math Post-Test Scores of 4th Grade Lab and Non-Lab Students for the 1976-1977 School Year; Covariate is CTBS Math Pre-Test Score.

	SOURCE OF VARIATION	Sum of Squares	Degree of Freedom	F-Ratio
1)	Saturated Model	.50616	3	106.940*
2)	Additive Model	.50616	2	160.411*
	a) Pre-test adjusted for Group	.42560	1	269.760*
	b) Group adjusted for Pre-test	.01269	1	8.043**
3)	Interaction of group with pre-test (covariate effect)	0	1	0
4)	Residual	.49384	313	

*$p << .01$

**$p < .01$

TABLE 15: Covariance Analysis of CTBS Math Post-Test Scores of 5th Grade Lab and Non-Lab Students for the 1976-1977 School Year; Covariate is CTBS Math Pre-Test Score.

	Grade 2				Grade 3				Grade 4				Grade 5			
	Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test	
	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N
Title I/ESAA Demonstration Lab Students	-		1.7	137	3.3	153	2.4	164	4.1	198	3.1	186	5.5	218	4.3	232
Non-Lab Students	-		1.5	114	3.3	98	2.2	117	3.7	115	2.9	130	4.6	113	3.6	117

Table 16: Mean CTBS Math Pre-test and Post-test Scores for Lab and Non-lab Students in Grades 2 through 5; 1976 - 1977 School Year

shows that for the 2nd and 3rd graders the group effect was not significant; that is, membership in experimental or control groups did not influence post-test scores. However, as we see from the element related to pre-test, the pre-test score is the significant determiner of post-test score. For the 4th graders, however, there was a significant group effect, according to the analysis of covariance table (Table 19). The magnitude of the effect is shown in Table 21. Under the 4th graders it may be seen that there was a 9 month gain for the lab students and only a 6 month gain for the non-lab students, a difference of 3 months. By comparison the difference in gain from pre- to post-test for 2nd graders was 1 month and there is, on the average, no more than a 2 month gain for the 3rd graders. Table 20 shows that for the 5th graders in the math labs and those in the math control groups, there was a significant covariate effect as shown in the table. Referring to the data in Table 21 we see that the 5th grade lab students rate of gain from pre-test to post-test is greater than that of the control students; that is, that while both groups gained from pre-test to post-test, the lab students gained at a greater rate. Thus the effects of group membership is not independent of the effects of pre-test score. Nevertheless, while this finding is statistically significant, the analysis of covariance table (Table 20) shows that, as has happened for the most part of the earlier analyses, the overwhelming influence on post-test score is pre-test score.

In summary, the results indicate that the hoped for effect of reading lab and math lab on post-test scores as measured by the CTBS are not found. With the exception of 4th grade reading and 4th grade math in the 1977-1978 school year and 5th grade math and 3rd grade reading in the 1976-1977 school year there was no demonstrable statistically significant effect of the reading and math labs.

	SOURCE OF VARIATION	Sum of Squares	Degree of Freedom	F-Ratio
1)	Saturated Model	.20392	3	17.333*
2)	Additive Model	.20376	2	25.980*
	a) Pre-test adjusted for Group	.20251	1	51.641*
	b) Group adjusted for Pre-test	.00398	1	1.015
3)	Interaction of group with pre-test (covariate effect)	.00016	1	.041
4)	Residual	.79608	203	

*$p << .01$

TABLE 17: Covariance Analysis of CTBS Math Post-Test Scores of 2nd Grade Lab and Non-Lab Students for the 1977-1978 School Year; Covariate is CTBS Math Pre-Test Score.

SOURCE OF VARIATION	Sum of Squares	Degree of Freedom	F-Ratio
1) Saturated Model	.15196	3	13.738*
2) Additive Model	.15110	2	20.490*
a) Pre-test adjusted for Group	.14939	1	40.517*
b) Group adjusted for Pre-test	.00570	1	1.546
3) Interaction of group with pre-test (covariate effect)	.00086	1	.233
4) Residual	.84804	230	

*$p << .01$

TABLE 18 Covariance Analysis of CTBS Math Post-Test Scores of 3rd Grade Lab and Non-Lab Students for the 1977-1978 School Year; Covariate is CTBS Math Pre-Test Score.

SOURCE OF VARIATION	Sum of Squares	Degree of Freedom	F-Ratio
1) Saturated Model	.47051	3	66.944*
2) Additive Model	.46311	2	98.837*
a) Pre-test adjusted for Group	.40203	1	171.602*
b) Group adjusted for Pre-test	.01978	1	8.443**
3) Interaction of group with pre-test (covariate effect)	.00740	1	3.159
4) Residual	.52949	226	

*$p << .01$

**$p < .01$

TABLE 19: Covariance Analysis of CTBS Math Post-Test Scores of 4th Grade Lab and Non-Lab Students for the 1977-1978 School Year; Covariate is CTBS Math Pre-Test Score.

SOURCE OF VARIATION	Sum of Squares	Degree of Freedom	F-Ratio
1) Saturated Model	.49500	3	91.815*
2) Additive Model	.49393	2	137.424*
a) Pre-test adjusted for Group	.44481	1	247.515*
b) Group adjusted for Pre-test	.00338	1	1.881
3) Interaction of group with pre-test (covariate effect)	.00107	1	5.954**
4) Residual	.50500	281	

*$p << .01$

**$p < .01$

TABLE 20: Covariance Analysis of CTBS Math Post-Test Scores of 5th Grade Lab and Non-Lab Students for the 1977-1978 School Year; Covariate is CTBS Math Pre-Test Score.

	Grade 2				Grade 3				Grade 4				Grade 5			
	Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test	
	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N
Title I/ESAA Demonstration Lab Students	2.4	153	1.6	157	3.3	174	2.4	184	4.3	180	3.4	181	5.3	209	4.2	215
Non-Lab Students	2.5	77	1.6	99	3.4	75	2.3	92	3.7	58	3.1	74	4.4	90	3.6	104

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Table 21: Mean CTBS Math Pre-test and Post-test Scores for Lab and Non-lab Students in Grades 2 through 5; 1977 - 1978 School Year

The previous pages describe the findings of the analysis concerning the comparison of lab and control groups within the year for 1976-1977 and 1977-1978 school years. The second major analysis contemplated for this study involved comparing the Title I demonstration labs conducted during the 1976-1977 and 1977-1978 school years with the labs conducted in the 1975-1976 school year. Such a comparison would have enabled the evaluation of changes in lab practices and diagnosis methods under the Title I demonstration program in comparison with that employed in earlier years. Unfortunately the data was not available for us to make this comparison in that we were not able to identify students who received lab services in school year 1975-1976. Repeated searching of the data base failed to identify the required student groups in that year. Thus, it was not possible to conduct this comparison.

CONCLUSIONS

As discussed in the introduction to this report, the overall question addressed during the conduct of this study was: "Can Title I funds be allocated in such a manner that the learning needs of both economically and educationally deprived school children are served without penalizing either group?"

This question breaks down into two specific components: 1) is there any difference in the number of students served and the quality of their achievement between the years in which academic criteria were applied and the year in which economic criteria were applied? 2) is there any difference in the quality of academic improvement between students served in the lab and comparable students not so served? With regard to the first specific question, it can be said that the number of students served in the years in which academic criteria were applied increased significantly over the year in which economic criteria were applied. Specifically, in the demonstration lab years of 1976-1977 and 1977-1978, 1073 and 1104 students were served respectively each year; this compares with 630 students served during the 1975-1976 school year. Thus, it is suggested that the numbers of students served under academic criteria not only equal but surpass the numbers served under economic criteria. The second part of this question concerning the relative quality of instructional delivery cannot be answered in this study because of the missing data problems described earlier.

The second question deals with the relative effects of lab as opposed to non-lab conditions on improvement from pre-test to post-test (both math and reading); we must conclude, unfortunately that for the groups studied,

utilization of individualized learning labs does not appear to significantly improve the gain in reading and math ability of the educationally deprived children. With the exception of one or two grades the presence of reading or math labs did not serve to improve the post-test scores significantly over the gains made by non-lab students.

Several factors could possibly be operating which would mask beneficial effects of the labs. First of all, there may not have been adequate coordination between activities carried out in the labs and subjects taught during the regular classroom sessions. Discussions with Berkeley County education personnel suggested that while the labs and the regular classrooms taught the same subjects, there was not sufficient coordination between the labs and the classrooms to ensure that the lab topics reinforced the classroom activities at the time they were presented. If this were the case, then conceivably students were taught lab remedial activities too far ahead or behind their presentation in the regular classroom to make a difference.

A second possible confounding influence stems from the fact that control of other possible influencing factors was attempted by means of assignment of schools. That is, control was experimental. By this we mean that within each group, lab and non-lab, schools were selected so that the average student I.Q. and economic status was roughly balanced between the two treatment groups. If it turned out that the experimental control was inadequate, other factors then may have operated to mask the effects of the lab program. Attempts to control statistically for these factors during the data analysis were unsuccessful due to lack of sufficient information.

The findings reported in the present study should not be construed as an indictment of the utility or effectiveness of reading and math labs in

the Berkeley County schools. Problems in data collection and analysis rendered the results obtained here somewhat equivocal. Further, research has demonstrated that individualized criterion referenced testing and teaching provides clear cut benefits to academically deprived or under-achieving children. The hard working dedication evidenced by personnel associated with the labs can, despite the difficulties experienced in the present study, be recognized as an important contribution to the educational progress of the students in Berkeley County.